



Exploring The Therapeutic Applications of *Trichosanthes Tricuspidata*: Pharmacological and Ethanobotanical Perspectives: A Review

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Abstract

Recently the trend of medicinal system of world is shifting from synthetic to herbal medicine, so we can say 'Come Back to Nature'. Medicinal plants known as millenaries and are highly respected all over the world as a rich source of therapeutic agents for the anticipation of diseases and ailments. Herbal drugs are well accepted among rural and urban community of Indian indigenous medicinal system (Ayurvedic, Sidha etc). *Trichosanthes tricuspidata* Lour. which is frequently known as Indrayan is a very little-exploited native plant of India has massive medicinal potential. The aim of this study was preliminary phytochemical investigation to find out the chemical constituents of the plant as well as evaluation of anthelmintic activity with respect to standard drug Albendazole. The result suggested that the aerial part of this plant has several chemical constituents like carbohydrates, glycosides, protein, amino-acids, phenolic compounds, saponins and tannins. Ethanolic and aqueous extract of the plant also show significant value for anthelmintic activity in dose dependent manner. But the chemical constituents responsible for pharmacological action are yet to be investigated. So further, investigation is required for evaluation and isolation of the chemical constituent which is responsible for these pharmacological actions.

Keywords

Trichosanthes Tricuspidata, Chemical Constituents, Pharmacological Activity, Ethanobotanical Uses.

INTRODUCTION:

Plants are thought to be extremely abundant sources of secondary metabolites, many of which have therapeutic applications. The majority of people on Earth still live in underdeveloped nations depending on herbal remedies to take care of their medical needs. Recently years, attention to herbal study has grown internationally and data gathered from many research surveys demonstrates the enormous potential of Indian system's medicinal herbs of conventional medical treatments.¹ The bulk of these plant species include high concentrations of

flavonoids, carotenoids, and phenolic compounds. These species are significant in the Vedic and Siddha medical systems due to their medicinal qualities, which include anti-HIV, cardioprotective, anti-ulcer, antidiabetic, hepatoprotective, anti-inflammatory, and larvicidal actions (2-3). *Tricuspidata* has long been used to treat asthma, migraines, fever, diabetes, and carbuncles. The seeds are both emetic and purgative. The herb is used as an antifever cure, a laxative, an anthelmintic, and in migraine treatments in Thai traditional medicine (4). The World Health Organization has estimated that more

than 80 % of the world's population in developing countries depends primarily on herbal medicines for their basic healthcare needs. The role of TLR4, the receptor for LPS, has been studied in various inflammation-related disorders.⁶ Medicinal plants are the most abundant source of medications for traditional and modern medicine, nutraceuticals, food supplements, and folk remedies. Medicines, pharmaceutical intermediates, and chemicals Entities representing synthetic drugs. The medicinal plant performs an important role. Role in the development of novel herbal medicines. Most of the Therapeutic herbs are harvested in the wild and lately Some medicinal plants are grown by

farmers.^{7,8} *Trichosanthes tricuspidata*, a traditional medicinal herb, is widely utilized in Ayurvedic medicine. Plant parts can be utilized to cure various conditions. Human illnesses. The plant possesses many purposes. Antibacterial, antifungal, anthelmintic, and larvicidal, antioxidant, anti-hyperglycaemic, anti-inflammatory action, gastroprotective activity, etc. This review covers the morphology, distribution, and Systemic classification, ethnobotanical applications, therapeutic Uses and phytoconstituents of *Trichosanthes tricuspidata* plant and different scientific discoveries relating to its pharmacology activities.



Fig 1. Leaves & Fruits of *Trichosanthes Tricuspidata*

CLASSIFICATION OF *TRICHOSANTHES TRICUSPIDATA*:

Kingdom	Plantae
Family	Cucurbitaceae
Genus	Trichoanthes
Species	Tricuspidata
Authority	Roxb
Synonym	Trichosanthes palmate
Common name	Lal indrayn, redball snakegourd

Table No: 1- Classification of *Trichosanthes Tricuspidata*

VERNACULAR NAME:

English	Red ball Snake gourd
Hindi	Mahakal, Indrayan
Marathi	Kaundal
Tamil	Ankorattai, Korattai
Malayalam	Kakkattonti
Telugu	Avaduta
Kannada	Avaguda – Hannu
Gujrati	Ratan indrayan
Sanskrit	Kakanasa, Shvetpushpi, Dhvamksanasa ³⁶

Table No: 2- Vernacular Name

PLANT DISTRIBUTION:

Trichosanthes tricuspidata is a climber which is found at an elevation of 1200 to 2300 m. *Trichosanthes tricuspidata* is found west Bengal and Southern

India.³⁷ It ranges from the Eastern Himalayas in India and southern China through southern Japan, Malaysia and tropical Australia.³⁸ Widely spread in

Myanmar, Thailand, Vietnam, West Malaysia and East of the Moluccas.³⁹

THE MORPHOLOGICAL CHARACTERISTICS:

1. Leaves

- **Shape:** Typically lobed, with three prominent lobes.
- **Size:** Large, broad leaves with a heart-shaped or ovate appearance.
- **Surface:** Usually smooth or slightly hairy, with a prominent venation pattern.
- **Color:** Dark green, often with a glossy surface.

2. Stems

- **Type:** Climbing or creeping, often using tendrils for support.
- **Structure:** Hollow and robust, with a green to brown coloration.
- **Texture:** May be smooth or slightly ridged.

3. Flowers

- **Type:** Unisexual flowers, typically solitary or in small clusters.
- **Color:** Usually white or pale green with a tubular shape.
- **Size:** Moderate in size, with five petals.

4. Fruit

- **Shape:** Elongated, cylindrical, often with three prominent ridges.
- **Size:** Can grow to a considerable length, usually several inches long.
- **Color:** Green when immature, turning yellow or orange as it ripens.
- **Texture:** Smooth outer skin with a fleshy interior.

5. Seeds

- **Shape:** Flattened and oval.
- **Color:** Typically, light brown or beige.
- **Size:** Small, with a hard seed coat.

MICROSCOPICAL CHARACTERISTICS:

1. **Leaf Anatomy:** The leaves typically show a palisade mesophyll layer with elongated chlorenchyma cells. The epidermis may be covered with a thin layer of cuticle, and stomata are present on the lower surface.
2. **Stem Structure:** The vascular bundles are arranged in a ring. The presence of fibers in the cortex provides structural support, and xylem vessels can be observed, which are typically wide and arranged in a circular pattern.
3. **Fruit and Seed Characteristics:** The fruit's outer layer (pericarp) displays layers of parenchyma cells, which may be filled with storage compounds. Seeds often show a hard outer coat with a distinct seed coat texture.
4. **Trichomes:** Non-glandular trichomes (hair-like structures) may be present on leaves and stems, which can serve protective functions.
5. **Cell Types:** Typical cell types include parenchyma, collenchyma (for support), and sclerenchyma (for additional rigidity), particularly in the fruit and stem.

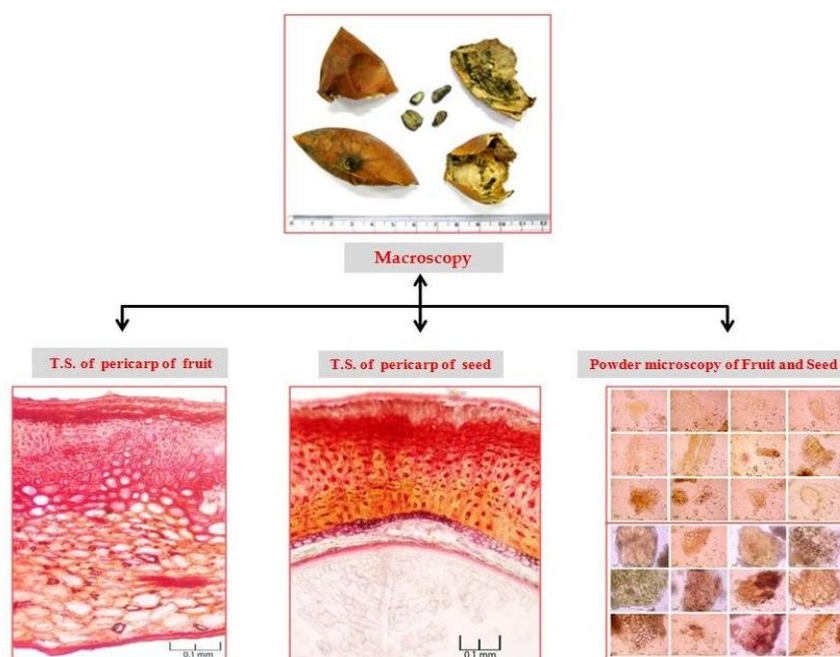


Fig 02: Microscopical Representation of *T. Tricuspidata*



Fig 03: Fruits of *Trichosanthes Tricuspidata*

CHEMICAL CONSTITUENTS:

Fruit contains cucurbitane glycosides cucurbitacin 2-O-b-glucopyranoside and 25-O-acetylcucurbitacin 2-O-b-glucopyranoside, khekadaengosides A–J, M–N, cucurbitacin K 2-O-b-glucopyranoside and cucurbitacin J 2-O-b-glucopyranoside, a hexa norcucurbitane glucoside (khekadaengoside K and octanor cucurbitane khekada engo side L).⁹ Seed contain fatty acid like n-Hexadecanoic acid, Octadecanoic acid, 9,12-Octadecadienoic acid, 9-Octadecenoic acid, methyl ester, (E) cis-vaccenic acid cis-10-Nonadecenoic acid, Oleic acid, methyl ester ethanone, n-hexylamine, N-acetyl-1-cyno-[1,2,3] triazole-4-carboxylic acid, Butyl 9,12 octadecadienoate, Methyl 9,12-heptadecadienoate, 9,12-octadecadienoic acid, 2-Methyl-z, z3, 13-octadecadienol 9-Octadecenal and (z)-

cyclopropaneoctanal etc.¹⁰ The root contains trichotetrol, tetrahydroxypentacyclic triterpenoid.¹¹ methyl palmitate, palmitic acid, suberic acid, α -spinasterol 3-o-beta-D-glucopyranoside, α spinasterol, stigmast-7-en-3-beta-ol, stigmast-7-en-3-beta-ol-3-O-beta-D-glucopyranoside, glyceryl 1-palmitate, glyceryl 1-stearate, 23,24-dihydrocucurbitacin D, bryonolic acid, cucurbitacin B, isocucurbitacin B, isocucurbitacin D, 3-epi-isocucurbitacin B and D-glucose.^{12,13} The leaf of *Trichosanthes tricuspidata* contains cyclotrichosantol and cycloeucalenol, cycloartane glycosides named cyclotricuspidosides A, B and C.^{11,14} Stem part of *Trichosanthes tricuspidata* contain three cycloartane glycosides, named cyclotricuspidosides A, B and C.¹⁴



Fig.04.Fruits of *Trichosanthes Tricuspidata*

THERAPEUTIC USES:

- *Trichosanthes tricuspidata* is considered as a medicinally important plant in Indian system of traditional systems (Ayurveda, Siddha and Unani) and other traditional medicinal systems.
- The fruits of *Trichosanthes tricuspidata* are bitter used to cure carminative, purgative, migraines, asthma, earache and ozoena.
- Fruit is used in asthma, lung disorder, as a violent hydrogogue cathartic, abortifacient, to reduce inflammation, reduce heat of the brain, ophthalmia, leprosy, weakness of limbs, epilepsy, stomatitis and rheumatism.
- Thai traditional system of medicine the plant is used to cure ant fever, anthelmintic, laxative and migraine. The seeds are emetic and purgative.^{15,9}
- The roots part is helpful to treat lung diseases in cattle, diabetic carbuncles and headaches.¹⁶ Plant used to treat bronchitis and seed paste help to cure hoof and cattle mouth disease.¹⁷
- The plant is used for curing snakebite poisoning and the juice of the plant is applied externally

for skin eruptions In Nepal the roots are used to cure bleeding in chickens.¹²

ETHANOBOTANICAL USES:

- The paste of *Trichosanthes tricuspidata* fruits is applied to cure headache (natural head balm), reducing macular swelling and pain, various types of skin infections, itching, lesions of fungal infections on feet during rainy seasons.
- It is used for killing the head lice and clear dandruff problems on head and helps to cure domestic cattle mouth inflammation also.²⁰ the root paste of *Trichosanthes tricuspidata* is externally applied on infected part to cure gonorrhoea¹⁹.
- Root juice is used to reduce blood sugar.¹⁸
- The seeds powder is given to treat jaundice, and it is also used to cure jaundice with tantani and gulwel.^{21,22} The *Trichosanthes tricuspidata* warm seed oil is applying for changing white hair colour to black hair.²³

PHARMACOLOGICAL ACTIVITY OF *T. TRICUSPIDATA*:

In this review, the pharmacological effects of *Trichosanthes tricuspidata* have been collected from various sources of literature.

1. **Antibacterial activity:** Bhardwaj et al. reported the different plant root extracts (ethanolic, aqueous ethanol and aqueous extracts) of *Trichosanthes tricuspidata* plant shows antibacterial activity against *Klebsiella pneumonia* and *Pseudomonas aeruginosa*. Saboo et al.^{24,25} reported the chloroform extract of *Trichosanthes tricuspidata* root shows a significant antibacterial activity. The different extracts (n-butanol, acetone, methanol and aqueous extracts) of *Trichosanthes tricuspidata* fruits were shows antibacterial activity against *Streptococcus pyogenes*, compare to all extracts methanolic extract shows more active.²⁰ *Trichosanthes tricuspidata* leaves petroleum ether, chloroform, ethanol, methanol and acetone extract was tested against Gram positive and Gram negative pathogens.²⁶ Ethanol extract showed greater inhibitions against *Bacillus cereus* *Klebsiella pneumonia*, *Klebsiella oxytoca* and *Brevibacterium paucivorans*. Ethanol extract shows a significant antibacterial activity when compare the other extracts.
2. **Anthelmintic Activities:** Ethano- botanically this plant was used by tribals to treat an intestinal worm infection which shows significant anthelmintic activity reported in experimental laboratory model. Anthelmintic

activity of *Trichosanthes tricuspidata* was carried out by Dubey.²⁸ In this investigation the aerial parts of *Trichosanthes tricuspidata* extracted with ethanol and water. Both extracts showed a more active when compared with standard drug Albendazole. Anthelmintic activity of both extracts was dose-dependent manner. Ethanolic extract of *Trichosanthes tricuspidata* showed more active then aqueous extract.

3. **Antioxidant Activity:** Antioxidant activity of different plant parts (leaf and fruit) of *Trichosanthes tricuspidata* were reported by Rodge et al.²⁹ In this study fruit part of the *Trichosanthes tricuspidata* showed more antioxidant activity compared to leaf was reported in the chloroform extract of *Trichosanthes tricuspidata*.²⁵ root showed more antioxidant activity compared to standard. It was reported that the methanolic extract of *Trichosanthes tricuspidata* leaves exhibited good antioxidant activity.²⁷
4. **Antifungal Activity:** Anti-Fungal Activity of *Trichosanthes tricuspidata* roots was carried out in chloroform extract of *Trichosanthes tricuspidata* roots showed a significant antifungal activity screened by agar- well diffusion method.²⁵
5. **Larvicidal activity:** *Trichosanthes tricuspidata* used as natural mosquito repellent, it may be helpful in the house to kill the mosquitoes, mice, etc. Sonwalkar et al.,³⁰ was reported the *Trichosanthes tricuspidata* fruit used as larvicidal activity. In this investigation two different extracts (methanol and petroleum ether) showed significantly high active mortality comparing with control. Methanolic fruit extract of *Trichosanthes tricuspidata* showed more larvicidal active than petroleum ether fruit extract
6. **Anti-hyperglycaemic activity:** *Trichosanthes tricuspidata* root extract was reported to cure the antidiabetic and hypolipidemic activity,³¹ studied carried out the ethanolic extract of *Trichosanthes tricuspidata* root was used to estimate the anti-diabetic activity of alloxan induced diabetic rats and biochemical parameters like cholesterol, triglyceride, serum protein, SGPT, SGOT, and ALP. Alloxan treated rats contain high blood glucose level when compared with normal control. Oral administration of ethanolic extract of *Trichosanthes tricuspidata* root was showed significantly decreased blood glucose level.

7. **Gastro protective activity:** Kannan et al reported the different extracts (Hexane, Chloroform, Ethanol and Water) of *Trichosanthes tricuspidata* leaves were compared with standard Ranitidine drug³². The Hexane extract showed significant high gastro protective activity when compared with all other extracts.
8. **The anti-haemolytic activity:** Anti-haemolytic activity of methanolic extract of
9. *Trichosanthes tricuspidata* leaves was reported by³³ anti-haemolytic activity screened by haemolysis of cow erythrocyte the plant extract was compared with the standard butylated hydroxy toluene (BHT). The methanolic extract of *Trichosanthes tricuspidata* showed 26.7% inhibition at 500 µg/ml concentration whereas standard BHT shows 89.63% at 500µg/ml.
10. **Anti-pyretic activity:** Kannan et al ³⁴ reported the different extract (ethanol and aqueous extract) of *Trichosanthes tricuspidata* Linn. Leaves contain anti-pyretic activity. Experimental analysis of the extracts was significantly reducing the body temperature of rats when compared to the standard paracetamol drug. *Trichosanthes tricuspidata* ethanol extract showed more antipyretic activity when compared to the aqueous extract.
11. **Anti-inflammatory activity:** The *Trichosanthes tricuspidata* ethanol extract showed the anti-inflammatory activity in lipopolysaccharide (LPS-) stimulated macrophages and mouse models of acute inflammatory disease.³⁵
12. **Anticonvulsant activity:** Epilepsy is a neurological disorder that affects around one-third of patients due to inadequate control of seizures with current drugs. A study evaluated the effect of *Trichosanthes tricuspidata* ethanolic extract on epilepsy-induced oxidative stress in mice. The results showed that the extract reduced lipid peroxidation and nitrite levels, restored antioxidant enzyme levels, and protected against neuronal cell loss in the hippocampus. These findings suggest that TTME has anticonvulsant and antioxidant properties, potentially reducing oxidative stress caused by seizures.²⁷
13. **Anticancer activity:** Chloroform extract of *Trichosanthes tricuspidata* root showed the most promising anticancer activity.²⁵They investigated the chloroform extract of roots containing 32 mg/gm of gallic acid and 28.5mg/gm of tannic acid. The chloroform extract exhibited potent cytotoxicity with an IC₅₀ of 42.88. From the data obtained, it was

observed that chloroform extract is effective against L1210 and MCF7 whereas extract have moderate effect on PC3 comparable to the standards Adriamycin.

CONCLUSION:

The World Health Organization has estimated that more than 80% of the world's population in developing countries depends primarily on herbal medicines for their basic healthcare needs. A thorough review of the published literature on *Trichosanthes tricuspidata* shows that it is a popular remedy in a variety of ethnic groups, as well as Ayurvedic and traditional practitioners for the treatment of a range of ailments. A perusal of the literature shows that *Trichosanthes tricuspidata* has been widely used for curing asthma, migraine, fever, diabetic carbuncles and other diseases. From the above research survey, it was concluded that the, traditional medicine is safe and has many therapeutic applications. The present review deals with its distribution, plant description, phytochemical properties, pharmacological activity, and therapeutic uses of *Trichosanthes tricuspidata*. Therefore, the information will help the scientists and researchers to screen the compounds responsible for different bioactivities, and to elucidate the mechanism of action.

RESULT:

Trichosanthes tricuspidata have many medicinal properties like antioxidant, anticancer, antibacterial, antifungal, Larvicidal activity, Anticonvulsant activity, Gastro protective activity and other activities. The Bioactive compounds of *Trichosanthes tricuspidata* responsible for its various medicinal properties and their effects at the molecular level need to be investigated in more detail.

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